



## Technical Report/Relatório Técnico

### Identification of Brazilian expertise in the fight against some neglected tropical diseases

Identificação das competências brasileiras como subsídio no enfrentamento de algumas doenças tropicais negligenciadas

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In 2010, the World Health Organization (WHO) published its first report on neglected tropical diseases (NTDs) in which it states that these diseases lack effective or adequate treatments. They are: Buruli ulcer (infection caused by *Mycobacterium ulcerans*), Chagas disease (American trypanosomiasis), cysticercosis, dengue, dracunculiasis (guinea-worm disease), fascioliose, endemic treponematoses, foodborne trematode infections (invertebrate parasites), human African trypanosomiasis (sleeping sickness), leishmaniasis, leprosy (Hansen disease), lymphatic filariasis (elephantiasis), onchocerciasis (river blindness), rabies, schistosomiasis (bilharziasis), trachoma, and soil-transmitted helminthiasis. It is estimated that around one billion people, or one sixth of the world's population, suffer from some neglected disease. Although they are typical of poor and developing countries, their occurrence has increased in developed nations and they have a devastating impact on humanity<sup>1</sup>.

Brazil's epidemiological peculiarities involve a number of factors and diseases, including a significant presence of NTDs<sup>2,3</sup>. It is therefore important to identify and map out the experts working in research in this area in order to create a structured source of reference for this sector. The hope is that this work will furnish data capable of enhancing interaction between researchers and health administrators in a bid to optimize technological processes and developments and to help in the Economic Complex and Industrial of Health (CEIS - Brazilian term)<sup>4</sup>.

The Brazilian Innovation Law (Act 10.973 of December 2<sup>nd</sup> 2004) is designed to encourage communication channels between the public and private sectors with a view to building capacities and achieving technical autonomy and industrial development in the country. It is therefore pertinent to identify the scientists from the areas of interest and support their work by means of collaborative networks with the potential to abate the ailments that afflict the Brazilian people, in this case, NTDs<sup>4,5</sup>.

This study involving the data mining and identification of specific expertise in NTDs. The data was taken from *Portal Inovação* ([http://](http://www.portalinovacao.mct.gov.br)

[www.portalinovacao.mct.gov.br](http://www.portalinovacao.mct.gov.br) - a government innovation website) accessed between July and September 2010) and the *Lattes* database run by *Conselho Nacional de Desenvolvimento Científico e Tecnológico* (CNPq); <http://lattes.cnpq.br/> accessed between July and October 2010 - a government science and technology research agency, as well bibliographical references were also consulted on indexed scientific databases.

The search of the *Portal Inovação* database yielded 1,522,352 active researchers and 86,450 research groups working in Brazil for all areas of knowledge.

In our investigation of *Portal Inovação* we identified 40,770 specialists working on NTDs, of whom 40,356 work on these six priority diseases (Chagas disease, dengue, Hansen disease, leishmaniasis, malaria and tuberculosis) according to Ordinance # 5 of February 2, 2006, issued by Health Ministry.

Interestingly, tuberculosis accounts for the highest number of professionals (10,960), or 27.2% of the total. Of the specialists involved in NTDs, 11.7% work with Chagas disease.

When we look at the breakdown of specialists per state, we can see that the highest numbers are in São Paulo, Rio de Janeiro and Minas Gerais, which have 8,560, 5,956 and 4,061, respectively. **Figure 1** shows the percentage of scientists working in each NTD in each Brazilian State, highlighting the highest and lowest concentrations of researchers (per disease) in given states. For instance, for malaria, the states with the highest proportions of scientists are São Paulo (SP), with 22.7%, Rio de Janeiro (RJ) with 16.1% and Pará (PA) with 9.3%. Meanwhile, the states with the fewest scientists working on malaria are Sergipe (SE) with 0.3%, Roraima (RR) with 0.4% and Mato Grosso do Sul (MS) with 0.5%.

If we compare the number of researchers in each state working on the priority NTDs, we see that São Paulo City takes the lead in the number of experts, followed by Rio de Janeiro, with the following breakdown per disease: tuberculosis > Chagas > dengue > leishmaniasis > Hansen disease > malaria. The state with the fewest professionals is Roraima, with 0.6% of the total, or just 70 professionals.

When the information on the experts in NTDs was crossed with their respective organizations using *VantagePoint* software, some partnerships between institutes of science, technology and innovation were identified. For instance, *Oswaldo Cruz Foundation* (FIOCRUZ) has 21 individual research projects, but is also involved in research partnerships with other institutions, including four with the Federal University of Rio de Janeiro (UFRJ), one with the

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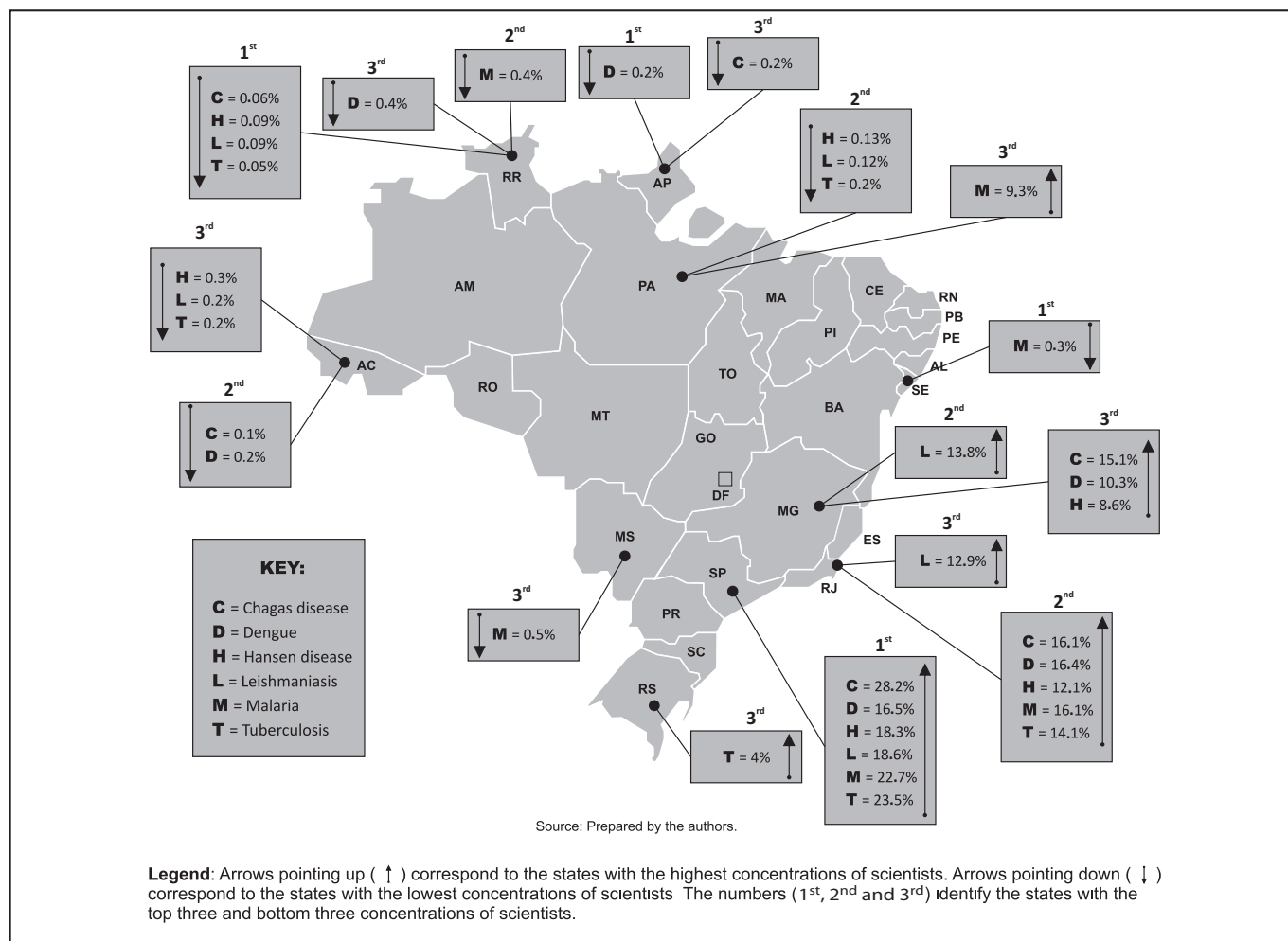


FIGURE 1 - Proportion of researchers working on neglected tropical diseases per state.

University of Brasilia (UnB), and one with the State University of Rio de Janeiro (UERJ). FIOCRUZ is followed by the University of São Paulo (USP), which has ten own projects, one partnership with UnB, one with the Federal University of Minas Gerais (UFMG) and one with *Rede Tuberculose* (TB). Meanwhile, UFRJ has four partnerships with FIOCRUZ and seven independent research projects.

*Researchers working in NTDs based on data from CNPq:* by observing the rating and relevance attributed by CNPq, the specialists in NTDs were identified and quantified by their specialization using the Lattes platform, as follows: 45 specialized in NTDs, 523 specialized in Chagas disease, 381 in dengue, 276 in Hansen disease, 439 in leishmaniasis, 423 in malaria and 546 in TB, totaling 2,633. This total of specialists corresponds to just 6.5% of all the specialists listed in *Portal Inovação*.

The vast majority of the specialists work at universities as researchers. However, of this total, just 0.005% have a technology and innovation research grant, and only two of these have doctorates: NB (a researcher from FIOCRUZ) classified as 1D and PRN (a researcher from Universidade Federal de Pernambuco) classified as 2.

*The Lattes database and Portal Inovação:* Just 0.2% of the specialists on the Lattes database are also registered in the Innovation Agent environment of *Portal Inovação*, since this is optional.

In view of this fact, and observing the networks<sup>6</sup> of partnerships identified in the research, the scientific publications of the first five researchers were checked to see if they had established projects and/

or research groups. In most cases, there were merely coincidences in the keywords used rather than any actual partnerships. However, one specialist was identified - AA, a researcher from USP - who does indeed have partnerships with other researchers.

Analyzing the distribution of specialists by type of NTD, note that even with a total of 11.7% working with Chagas disease, as yet there is just one kind of treatment available for this condition, which is highly toxic. This is not produced in Brazil either by official drug laboratories or by private drug companies by the end of 2011, when the public-private partnership (Nortec chemical, Laboratório Farmacêutico do Estado de Pernambuco, Ministry of Health and Drugs for Neglected Disease *initiative*), managed to carry out the production in the country<sup>5</sup>.

The case of malaria contrasts greatly with that of TB. Only 9.4% of the scientists are involved in researching it, but even though it has the fewest researchers, it is the only one to have produced a successful innovation in recent years: a new 2-in-1 treatment (artesunate + mefloquine)<sup>7,8</sup>.

When we compared the number of specialists in the country with the estimated number of cases of the diseases<sup>9</sup> we found a certain disparity. Worldwide, malaria is responsible for one million deaths a year. In Brazil, 99% of which are in the Amazon region. However, just 9.3% of the scientists working on malaria are in the Amazonian State of Pará. Likewise, around 60% of the researchers working on Chagas disease are in the south-east of the country, but the disease

itself is concentrated in the north, north-east and central-west regions of the country, where it affects between two and three million people. Another case in point is TB, with an average of 83,000 new cases a year, mostly in the north. Although it is endemic across the country, around half of the specialists are in the south and south-east. Finally, 74% of the 390,000 people a year who contract leishmaniasis live in the north and north-east of the country, but 45% of the professionals working on the disease live in the south-east.

Regarding the researchers of NTDs per institution based on data from *Portal Inovação*, interestingly, USP is involved in five of the six priority NTDs identified by the Health Ministry (it does not work with leishmaniasis). Likewise, FIOCRUZ works with all six priority NTDs except Hansen disease.

Concerning networks based on data from CNPq, in general, the researchers rated most highly (1A) by CNPq analyze more than one NTD, a fact that could be used to harness cooperation and the sharing of knowledge<sup>10</sup> on NTDs in Brazil.

*Portal Inovação* is an important tool for technological innovation management, but in view of the limitations and discrepancies between it and the number of senior researchers indicated by CNPq, the government would be well advised to encourage the 6.5% top-level scientists (1A, 1B, 1C, 1D and 2) to undertake research in partnership with the approximately 40,000 specialists listed in *Portal Inovação*. This would help develop competencies (train human resources), share research, and leverage scientific and technological development, whether or not CNPq increases the number of research grants in the country.

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